Claims:

1. A process for manufacturing rare earth metal oxide thin films on a substrate by an ALD type process in an ALD reactor having a reaction space, wherein a repeated pulsing cycle comprises the steps of

- feeding a vapor phase pulse of a rare earth metal source chemical with the help of an inert carrier gas into the reaction space of the ALD reactor, said metal source chemical being a cyclopentadienyl compound of the rare earth metal;
- contacting the vapor phase pulse of the rare earth metal source chemical with the surface of the substrate to bind the rare earth metal source chemical to the surface;
- purging the reaction space with an inert gas to remove any unreacted rare earth metal source chemical from the reactor;
- feeding a vapor-phase pulse of a reactive oxygen source chemical with the help of an inert carrier gas into the reaction space;
- reacting the oxygen source chemical with the rare earth metal source chemical bonded to the surface to form a rare earth metal oxide on the surface; and
- purging the reaction space with an inert gas to remove any unreacted oxygen source chemical from the reactor.

2. The process according to claim 1, c h a r a c t e r i z e d in that the reactive source of oxygen is water or a mixture of oxygen and ozone.

3. The process according to claim 1, c h a r a c t e r i z e d in that the reactive source of oxygen is hydrogen peroxide or a mixture of water and hydrogen peroxide.

4. The process according to claim 1, c h a r a c t e r i z e d in that the reactive source of oxygen is oxygen plasma.

5. A process for manufacturing yttrium oxide (Y_2O_3) or lanthanum oxide (La_2O_3) thin films by an ALD type process where

- a vapor phase pulse of a metal source chemical is fed with the help of an inert carrier gas into the reaction space of an ALD reactor;
- the reaction space is purged with an inert gas;

- a vapor-phase pulse of an oxygen source chemical is fed with the help of an inert carrier gas into the reaction space; and
- the reaction space is purged with an inert gas,

c h a r a c t e r i z e d in that the metal source chemical is tris(cyclopentadienyl)yttrium (Cp_3Y), tris(methylcyclopentadienyl)yttrium ($(CpMe)_3Y$) or tris(methylcyclopentadienyl)lanthanum ($(CpMe)_3La$) and the oxygen source chemical is water or a mixture of oxygen and ozone.

6. A process according to claim 3, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 450 °C, preferably from 200 to 400 °C and the deposition pressure is between 1 and 50 mbar when depositing Y_2O_3 from $(CpMe)_3Y$.

7. A process according to claim 3, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 450 °C, preferably from 200 to 400 °C and the deposition pressure is between 1 and 2 mbar when depositing Y_2O_3 from $(CpMe)_3Y$.

8. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 400 °C, preferably from 250 to 300 °C and the deposition pressure is between 1 and 50 mbar when depositing Y_2O_3 from Cp_3Y.

9. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 400 °C, preferably from 250 to 300 °C and the deposition pressure is between 1 and 2 mbar when depositing Y_2O_3 from Cp_3Y.

10. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 160 to 165 °C and the deposition pressure is between 1 and 50 mbar when depositing La_2O_3 from $(CpMe)_3La$.

11. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 160 to 165 °C and the deposition pressure is between 1 and 2 mbar when depositing La_2O_3 from $(CpMe)_3La$.

12. A process according to claim 1 or claim 5, c h a r a c t e r i z e d in that the substrate is a silicon wafer or soda lime glass.

13. A process according to claim 1 or claim 5, characterized in that the substrate is a compound semiconductor.

14. A process according to claim 13, wherein the substrate is GaAs.